



Technical Research Study

# Key Considerations for Modernizing IT Infrastructure

Reap the benefits of consolidation while updating your organization's infrastructure.

# Introduction

Organizations of all sizes understand the importance of delivering faster time to insights, high availability, and data security for their customers. But legacy systems often can't keep up with the demands of modern analytics, artificial intelligence (AI), and other performance-hungry workloads. Older infrastructure is also inefficient and can hinder an organization's ability to reduce power and cooling usage, making it harder to meet sustainability goals. In addition, dated infrastructure can also be prone to reliability issues and security weaknesses.

Clearly there are strong incentives for organizations to modernize. But how do companies evaluate and compare the available systems effectively to get the most value from their upgrade investment?

To help organizations answer this question, Prowess Consulting identified five key areas that are crucial to consider when modernizing IT infrastructure:

- Performance
- Energy/power consumption
- Security (hardware, software, and processes)
- Sustainability
- Consolidation

We looked at each of these key areas systematically by comparing legacy and modern servers from a popular vendor (Lenovo) built on popular Intel® Xeon® Scalable processors. We investigated the benefits of upgrading both the Lenovo® chassis and the integrated hardware components, in addition to the Intel® CPUs powering the systems. Our findings are presented in three sections:

- **Performance**, including overall performance and performance/power ratios
- **Security and reliability**, factoring in hardware, software, and process-related considerations
- **Energy efficiency and sustainability**, from hardware to packaging to disposal

Our research determined organizations that upgrade from first-generation Lenovo® ThinkSystem™ SR650 servers (with 2nd Gen Intel Xeon Scalable processors) to ThinkSystem SR650 V3 servers (featuring 4th Gen Intel Xeon Scalable processors) can achieve significant value while modernizing their IT infrastructures—with improvements across all the key areas that we investigated. The increased energy efficiency of ThinkSystem SR650 V3 servers allows organizations to do more with less to consolidate their infrastructure footprints. A smaller footprint can help organizations meet key sustainability goals while also delivering high performance, reliability, and security. Moreover, you can realize additional benefits through intentional decision making during your modernization journey, such as the energy savings and related sustainability benefits that result from upgrading your CPUs. This is an important strategy for upgrading and modernizing your IT infrastructure.

## Systems Used for Our Research

To standardize our research, we selected platforms from Lenovo, a popular data-center-server vendor that consistently ranks in the top five server companies in terms of market share.<sup>1</sup> Specifically, we looked at the following legacy and modern Lenovo platforms:

- First-generation ThinkSystem SR650: 2U, two-processor server with a 2nd Gen Intel Xeon Platinum processor (for example, an Intel Xeon Platinum 8280 processor with 28 cores) and DDR4 memory, introduced in Q2 of 2019
- ThinkSystem SR650 V3: 2U, two-processor server with a 4th Gen Intel Xeon Platinum processor (for example, an Intel Xeon Platinum 8490H processor with 60 cores) and DDR5 memory, introduced in Q1 of 2023



**Figure 1** | Servers evaluated in this study

Note that although organizations could rely on hyperconverged infrastructure (HCI) solutions as part of their modernization strategies, we specifically focused on traditional physical server modernization for this study to cover a broad range of solutions and support for workloads.

## Performance and Performance/Power Ratios

Our investigation of the Lenovo ThinkSystem SR650 V3 server, powered by 4th Gen Intel Xeon Scalable processors, uncovered leading performance across several industry benchmarks, as shown in Table 1.

**Table 1** | Various benchmark results for the Lenovo® ThinkSystem™ SR650 V3 server

| Benchmark                | Metric                                    | Result                               | Ranking | System                                                       |
|--------------------------|-------------------------------------------|--------------------------------------|---------|--------------------------------------------------------------|
| SAP HANA® (BWoh)         | Runtime for 1.3B records (two processors) | 63 seconds                           | 2       | Lenovo® ThinkSystem™ SR650 V3 two-socket server <sup>2</sup> |
| TPC Benchmark™ E (TPC-E) | Performance (two processors)              | 12,437 transactions per second (TPS) | 2       | ThinkSystem SR650 V3 two-socket server <sup>3</sup>          |
| TPC-E                    | Price/performance (two processors)        | 95.46 USD                            | 7       | ThinkSystem SR650 V3 two-socket server <sup>3</sup>          |

**Note:** The TPC Benchmark™ E (TPC-E) referenced in Table 1 measures transactions per second (TPS).<sup>4</sup> The SAP HANA® hardware and cloud measurement tools test SAP HANA workloads to ensure compliance with SAP standards and baseline performance.<sup>5</sup>

We also identified performance-related benefits resulting from modernizing with Lenovo ThinkSystem SR650 V3 servers, compared to the older-generation ThinkSystem SR650 servers. For example, ThinkSystem SR650 V3 servers with 4th Gen Intel Xeon Scalable processors can run—and be optimized for—modern workloads and systems, such as AI, analytics, networking, storage, and high-performance computing (HPC).

The ThinkSystem SR650 V3 servers offer DDR5 memory, which provides 50% more bandwidth than the DDR4 memory found in the first-generation ThinkSystem SR650 servers. This increase can bring improved performance to demanding workloads.

Another potential benefit of modernizing your IT infrastructure is the ability to consolidate servers in the data center for a reduced footprint. ThinkSystem SR650 V3 servers support 3:1 server consolidation, compared to first-generation ThinkSystem SR650 servers, for up to a 70% reduction in server count.<sup>6</sup> This consolidation can deliver greater energy efficiency, and it can help optimize total cost of ownership (TCO).

Our investigation also found that modernizing your IT infrastructure in one area, such as CPUs, often provides additional benefits beyond that specific upgrade. For example, reducing your overall number of servers when upgrading can potentially save you money on software licensing costs and lower your TCO, in addition to simplifying server management. Moreover, the potential energy savings associated with upgrading CPUs in this example can also help you meet your sustainability goals (as described in the [Energy Efficiency and Sustainability](#) section of this paper). By choosing your infrastructure upgrades in an intentional way, you can reap numerous benefits from a single upgrade while often finding additional cost savings in the process.

## Performance Spotlight

Lenovo® ThinkSystem™ SR650 V3 servers see increased energy efficiency as an additional benefit of upgrading to 4th Gen Intel® Xeon® Scalable processors. Reduced power consumption from improved energy efficiency can translate to a lower TCO and can help meet sustainability goals. Some of these additional benefits include:

- Up to 20% CPU power savings at less than 5% performance impact<sup>7</sup>
- Up to 70 W reduced power usage per socket at low utilization<sup>8</sup>
- 2.9x average performance-per-watt efficiency improvement<sup>9</sup>

## Security and Reliability

A modernized infrastructure provides a more secure, reliable, holistic platform. Lenovo ThinkSystem V3 servers are powered by 4th Gen Intel Xeon Scalable processors with built-in workload accelerators, which offer a number of benefits to strengthen security, compared to older-generation platforms.

Intel® Software Guard Extensions (Intel® SGX) helps protect sensitive data and application code while actively in use, which minimizes the attack surface and helps to defend against breaches, leaks, or attacks.<sup>10</sup>

Some of Intel's built-in accelerators, such as Intel® QuickAssist Technology (Intel® QAT) and Intel® Crypto Acceleration, help improve cryptography performance. The crypto-acceleration technologies embedded in 4th Gen Intel Xeon Scalable processors provide improved performance and cryptographic security, without requiring additional cores and processors for your data center.<sup>11</sup>

Lenovo builds on Intel's architecture to enhance security. For example, Lenovo's immutable hardware root of trust will only

boot the server with trusted firmware, and it allows for data recovery in the unlikely event of tampering or corruption.<sup>12</sup> In addition, Lenovo® System Guard monitors a server's internal hardware inventory to detect unauthorized entry or tampering.<sup>12</sup>

In terms of supply chain, the Lenovo Infrastructure Solutions Group (ISG) owns and controls its own manufacturing operations, helping Lenovo monitor and maintain a secure development cycle and a trusted supply chain. That security is also reflected in Lenovo's Trusted Supplier Program, which specifies and ensures supplier security requirements and standards through careful screening/vetting of all suppliers.<sup>12,13</sup>

Lenovo takes a holistic approach to security, from data center to supply chain, that has led to a number of top-10 rankings in the security, reliability, and supply-chain categories for Lenovo over the last decade. According to Information Technology Industry Council (ITIC) 2022 Security and Reliability surveys, Lenovo ranked number-1 in reliability for nine years and number-1 in security for four years among all x86 servers.<sup>13,14</sup> Lenovo is also ranked number-8 among all supply chains by Gartner (2023), reflecting Lenovo's emphasis on built-in security throughout the supply chain.<sup>15</sup>

## Security Spotlight: Intel® Transparent Supply Chain

Lenovo was the first tier-1 manufacturer to offer Intel Transparent Supply Chain, which is essentially a "birth certificate" for Intel®-based Lenovo® ThinkSystem™ servers (such as the ThinkSystem SR650 V3 server) and Lenovo® ThinkAgile™ solutions. This certification can provide excellent transparency, security, and confidence for your supply chain from start to finish.<sup>12,16</sup>



## Energy Efficiency and Sustainability

Lenovo's collaboration with Intel provides a number of sustainability-centered benefits that can help you meet your organization's sustainability goals. For example, Lenovo uses 100% recycled packaging.<sup>17</sup> On the Intel side, Intel Xeon processors are manufactured using 90–100% renewable electricity at sites with water-reclamation facilities.<sup>18</sup>

The ThinkSystem SR650 V3 servers, with 4th Gen Intel Xeon Scalable processors, also feature numerous improvements around energy efficiency and sustainability. Upgrading from the 2nd Gen Intel Xeon Scalable processors in the first-generation ThinkSystem SR650 servers to the 4th Gen Intel Xeon Scalable processors in the ThinkSystem SR650 V3 servers can provide up to a 38% reduction in CO<sub>2</sub> emissions and power usage.<sup>6</sup> This represents significant savings in power bills for lower TCO, in addition to a reduction in CO<sub>2</sub> emissions for improved sustainability.

Other server features let organizations keep closer tabs on their energy usage, beginning with built-in advanced telemetry in 4th Gen Intel Xeon Scalable processors. This telemetry allows monitoring and control of electricity consumption and carbon emissions for improved energy efficiency and more control over sustainability.<sup>18</sup>

Additionally, while not specifically addressed in this paper, the ThinkSystem SD650 V3 platform, a close relative of the ThinkSystem SR650 V3 server, offers a more robust cooling option called direct water cooling. This feature can reduce data center energy costs by up to 40%, increase system performance by up to 10%, and deliver up to 100% heat removal efficiency (depending on the specific environment).<sup>19</sup>

**Figure 2** | Lenovo® ThinkSystem™ SD650 V3 server tray showing the direct-water cooling (DWC) module



### Sustainability Spotlight: Lenovo® Asset Recovery Services (ARS)

Lenovo Asset Recovery Services (ARS) acts as an all-in-one solution for the secure, documented disposal of your IT assets as they reach end of life. This service's focus is on both data and environmental security, and it can be customized to your organization's specific needs.<sup>20</sup> This service can provide increased security, flexibility, and confidence when modernizing your IT infrastructure, even after the process is complete.

## A Generational Upgrade

Finally, we examined some of the benefits to upgrading from 2nd Gen Intel Xeon Scalable processors to 4th Gen Intel Xeon Scalable processors in more detail.<sup>6</sup> Table 2 gives you an idea of the potential savings and ancillary benefits from modernizing your IT infrastructure and upgrading from first-generation ThinkSystem SR650 servers (with 2nd Gen Intel Xeon Scalable processors) to ThinkSystem SR650 V3 servers (with 4th Gen Intel Xeon Scalable processors).

**Table 2** | Comparison of 2nd Gen Intel® Xeon® Scalable processors versus 4th Gen Intel Xeon Scalable processors<sup>6</sup>

| Category                                              | 2nd Gen Intel® Xeon® Scalable Processor | 4th Gen Intel Xeon Scalable Processor | Benefit                                          |
|-------------------------------------------------------|-----------------------------------------|---------------------------------------|--------------------------------------------------|
| Number of Intel Xeon Scalable processor-based servers | 50                                      | 15                                    | Up to 70% reduction in server count              |
| Fleet power (kilowatts)                               | 1.1M kWh                                | 687K kWh                              | Up to 38% reduction in power usage               |
| CO <sub>2</sub> emissions                             | 471,642 kg                              | 291,341 kg                            | Up to 38% reduction in CO <sub>2</sub> emissions |
| TCO                                                   | \$1.5M                                  | \$571K                                | Up to 62% reduction in TCO                       |

## A Final Word

Our research concludes that Lenovo ThinkSystem SR650 V3 servers, powered by 4th Gen Intel Xeon Scalable processors, enable significant consolidation through generational performance gains, improved security, and notable efficiency upgrades, compared to older-generation ThinkSystem SR650 servers. Modernizing your IT infrastructure with ThinkSystem SR650 V3 servers can also offer a number of potential ancillary benefits, from a smaller data center made possible by rack consolidation, to that smaller data center using fewer servers for increased energy savings and a lower TCO. If you're looking to upgrade your older systems to improve security, reliability, sustainability, TCO optimization, and workload optimization, then ThinkSystem SR650 V3 servers are an excellent choice.

## Learn More

- For information on the Intel and Lenovo partnership, see [“Lenovo and Intel building solutions for tomorrow.”](#)
- For more information on Lenovo ThinkSystem SR650 V3 servers, see the [Lenovo ThinkSystem SR650 V3 datasheet](#).
- For more information on 4th Gen Intel Xeon Scalable processors, see [“4th Gen Intel Xeon Scalable Processors.”](#)

## Appendix

Table 3 shows the two server platforms compared in this technical research study.

**Table 3** | Servers compared in this paper

| Server                     | Version          | Configuration      | Processor                               | Example CPU SKU | Total Cores   | Memory Type | Launch Date |
|----------------------------|------------------|--------------------|-----------------------------------------|-----------------|---------------|-------------|-------------|
| Lenovo® ThinkSystem™ SR650 | First-generation | 2U, two processors | 2nd Gen Intel® Xeon® Scalable processor | Platinum 8280   | 56 cores max  | DDR4        | Q2 2019     |
| Lenovo ThinkSystem SR650   | V3               | 2U, two processors | 4th Gen Intel Xeon Scalable processor   | Platinum 8490H  | 120 cores max | DDR5        | Q1 2023     |

<sup>1</sup> History Computer. “[The 10 Largest Server Companies in the World, and What They Do.](#)” August 2023.

<sup>2</sup> SAP. “[SAP Standard Application Benchmarks & Certified Hardware for SAP Solutions on Microsoft Windows.](#)” July 2023.

<sup>3</sup> TPC. “[TPC-E Top Performance Results.](#)” July 2023.

<sup>4</sup> TPC. “[Overview of TPC-E.](#)” Accessed August 2023.

<sup>5</sup> SAP. “[How to Use the SAP HANA Hardware and Cloud Measurement Tools.](#)” April 2022.

<sup>6</sup> Intel. “[Minimize Total Cost of Ownership with a Server Refresh.](#)” June 2023. Comparing benefits transitioning from [Intel Xeon Silver 4210 processors](#) to [Intel Xeon Gold 5420+ processors](#). Up to 3:1 consolidation and 62% TCO savings with 4th Gen Intel® Xeon® Scalable processors. Calculations as of April 28, 2023, based on the Intel node TCO and power calculator using default power, cost, and TCO assumptions over a five-year TCO horizon comparing replacing 50 older servers with Intel Xeon Silver 4210 processors with new servers using Intel Xeon Gold 5420+ processors. Results may vary. Performance measurements based on published SPECrate®2017\_int\_base on spec.org as of March 28, 2023.

<sup>7</sup> Up to 20% CPU power savings at less than 5% performance impact with Intel’s new Optimized Power Mode feature. For details, see [E6] at [intel.com/processorclaims](#): 4th Gen Intel® Xeon® Scalable processors. Results may vary.

<sup>8</sup> Reduced power usage where customers tend to run (at approximately 30-40% utilization), up to 70 W per socket at low utilization. For details, see [E6] at [intel.com/processorclaims](#): 4th Gen Intel® Xeon® Scalable processors. Results may vary.

<sup>9</sup> 2.9x average performance per watt efficiency improvement with targeted workloads (using built-in accelerators compared to previous-generation Intel® Xeon® Scalable processors). For details, see [E1] at [intel.com/processorclaims](#): 4th Gen Intel Xeon Scalable processors. Results may vary.

<sup>10</sup> Intel. “[Help Protect and Isolate Confidential Data—Even While You Share and Process It.](#)” September 2022.

<sup>11</sup> Intel. “[Accelerate innovation and enhance data protection with Intel® Security Engines.](#)” 2023.

<sup>12</sup> Lenovo. “[Lenovo Security by Design: Foundational Security from Edge to Cloud.](#)” October 2022.

<sup>13</sup> ITIC. “[IBM Z, IBM Power Systems & Lenovo ThinkSystem Servers Most Secure, Toughest to Crack.](#)” November 2022.

<sup>14</sup> ITIC. “[ITIC 2022 Global Server Reliability Survey Finds IBM Z, IBM Power Systems, Lenovo ThinkSystem deliver top reliability.](#)” November 2022.

<sup>15</sup> Gartner. “[Gartner Announces Rankings of the 2023 Global Supply Chain Top 25.](#)” May 2023.

<sup>16</sup> Lenovo. “[Introduction to Intel Transparent Supply Chain on Lenovo ThinkSystem Servers.](#)” April 2023.

<sup>17</sup> Lenovo. “[Unpacking the Eco-Friendly Future of Packaging.](#)” September 2020.

<sup>18</sup> Intel. “[Intel’s Most Sustainable Data Center Processor.](#)” January 2023.

<sup>19</sup> Lenovo. “[Lenovo ThinkSystem SD650 V3: Liquid cooling innovation for a highly efficient data center.](#)” February 2023.

<sup>20</sup> Lenovo. “[Asset Recovery Services: Simplify your asset recovery and disposal.](#)” March 2020.